

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

| | |
|---|---|
| Date of mailing (day/month/year) 11 April 2001 (11.04.01) | |
| International application No. PCT/GB00/03085 | Applicant's or agent's file reference IPD/P2854/WOD |
| International filing date (day/month/year) 15 August 2000 (15.08.00) | Priority date (day/month/year) 18 August 1999 (18.08.99) |
| Applicant GREENAWAY, Alan, Howard et al | |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

26 January 2001 (26.01.01)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

| | |
|---|---|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35 | Authorized officer Pascal Piriou Telephone No.: (41-22) 338.83.38 |
|---|---|

PATENT COOPERATION TREATY

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NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

BOWDERY, A., O.
Qinetiq Limited
IP Formalities
A4 Bldg., Cody Technology Park
Ively Road, Farnborough
Hampshire GU14 0LX
ROYAUME-UNI

| | |
|--|---|
| Date of mailing (day/month/year) 25 October 2001 (25.10.01) | IMPORTANT NOTIFICATION |
| Applicant's or agent's file reference IPD/P2854/WOD | |
| International application No. PCT/GB00/03085 | International filing date (day/month/year) 15 August 2000 (15.08.00) |

1. The following indications appeared on record concerning:

☒ the applicant

 ☐ the inventor

 ☐ the agent

 ☐ the common representative

Name and Address

 THE SECRETARY OF STATE FOR DEFENCE
 Defence Evaluation Research Agency
 A4 Building
 Ively Road
 Farnborough
 Hampshire GU14 0LX
 United Kingdom

State of Nationality

GB

State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person

 ☐ the name

 ☐ the address

 ☐ the nationality

 ☐ the residence

Name and Address

 QINETIQ LIMITED
 85 Buckingham Gate
 London SW1 6TD
 United Kingdom

State of Nationality

GB

State of Residence

GB

Telephone No.

Facsimile No.

Teleprinter No.

3. Further observations, if necessary:

Address of the agent has been changed accordingly.

4. A copy of this notification has been sent to:

| | |
|--|---|
| <input checked="" type="checkbox"/> the receiving Office | <input type="checkbox"/> the designated Offices concerned |
| <input type="checkbox"/> the International Searching Authority | <input checked="" type="checkbox"/> the elected Offices concerned |
| <input type="checkbox"/> the International Preliminary Examining Authority | <input type="checkbox"/> other: |

 The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Anman QIU

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

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REC'D 10 JUL 2001

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



| | | |
|---|---|--|
| Applicant's or agent's file reference IPD/P2854/WOD | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/GB00/03085 | International filing date (day/month/year) 15/08/2000 | Priority date (day/month/year) 18/08/1999 |
| International Patent Classification (IPC) or national classification and IPC G02B27/10 | | |
| Applicant THE SECRETARY OF STATE FOR DEFENCE et al | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:
 - I ☒ Basis of the report
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

| | |
|---|---|
| Date of submission of the demand 26/01/2001 | Date of completion of this report 06.07.2001 |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | Authorized officer Casse, M Telephone No. +49 89 2399 2769  |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03085

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

| | | |
|-----|---------------------|------------|
| 4-8 | as originally filed | |
| 1-3 | with telefax of | 13/06/2001 |

Claims, No.:

| | | |
|------|-----------------|------------|
| 1-10 | with telefax of | 13/06/2001 |
|------|-----------------|------------|

Drawings, sheets:

| | |
|---------|---------------------|
| 1/6-6/6 | as originally filed |
|---------|---------------------|

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/03085

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|------|--------|------|
| Novelty (N) | Yes: | Claims | 1-10 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | 1-10 |
| | No: | Claims | |
| Industrial applicability (IA) | Yes: | Claims | 1-10 |
| | No: | Claims | |

2. Citations and explanations
see separate sheet

R Item V

Document US4849825, which is considered to represent the most relevant state of the art, discloses (cf. Figure 3) an apparatus for producing a plurality of spatially separated images (6a,6b) from an object field (1) comprising:

- an optical system (2,4) arranged to produce an image (7) associated with a first optical transfer function;
- a diffraction grating (3) arranged to produce, in concert with the optical system, images (6a,6b) associated with each diffraction order;
- ancillary optical modules (9a,9b) operating on individual diffraction orders;
- means for detecting the images (6a,6b)

wherein

- the optical system and diffraction grating are located on an optical axis (see fig. 3), the diffraction grating is located in a suitable grating plane and the ancillary optical modules modify the transfer functions associated with the images (as they provide astigmatic power col.3 l.63-66).

The subject-matter of claim 1 therefore differs from this known apparatus in that the optical system and diffraction grating are arranged such that a plurality of object planes is imaged and each image associated with a diffraction order corresponds to a different object plane. The subject-matter of claim 1 is therefore novel.

The problem to be solved by the present invention may therefore be regarded as providing a three dimensional imaging device which is aberration corrected for a plurality of image planes.

Such a device is known from EP0517491 which provides a variable aberration correction with an adjustable optical element or a plurality of optical correctors which are inserted in the optical axis. However, this document does not teach a simultaneous correction and imaging of all object planes and it would not be obvious either to modify the apparatus according to US4849825 to provide multiple object planes. The subject matter of claim 1 appears therefore to be inventive.

Claims 2 to 10 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | |
|--|---|--|
| Applicant's or agent's file reference P2854/WOD | FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. | |
| International application No. PCT/GB 00/ 03085 | International filing date (day/month/year) 15/08/2000 | (Earliest) Priority Date (day/month/year) 18/08/1999 |
| Applicant THE SECRETARY OF STATE FOR DEFENCE | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

THREE DIMENSIONAL IMAGING SYSTEM

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

6

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 00/ 03085

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A three dimensional imaging system is described which uses a diffraction grating (4) to divide a wavefront and ancillary optical modules (5,6,7) in each diffraction order to modify the imaging characteristics in each order. Object planes (9,10,11) located at different distances from the diffraction grating are imaged simultaneously and spatially separated (12,13,14) on a single image plane and correction for different levels of spherical aberration associated with different object planes is achieved.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/03085

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G02B27/10 G11B7/135 G02B27/00 G02B5/18 G02B5/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G02B G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | US 4 849 825 A (KURATA YUKIO ET AL) 18 July 1989 (1989-07-18) | 1,7-9 |
| Y | column 3, line 22 -column 4, line 20; claim 1; figures 2,3 --- | 2 |
| X | US 5 278 817 A (KITABAYASHI JUNICHI ET AL) 11 January 1994 (1994-01-11) column 8, line 4-52; figures 8,17,26 column 13, line 5-63 column 13, line 16-26 --- | 1,6-9 |
| X | US 5 933 277 A (HARRINGTON MARIE IRENE ET AL) 3 August 1999 (1999-08-03) column 6, line 32-65; figure 5 --- -/-- | 1,7,8 |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

23 November 2000

Date of mailing of the international search report

01/12/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
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Authorized officer

Casse, M

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/03085

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| Y | US 4 467 188 A (SUZUKI TAKASHI ET AL) 21 August 1984 (1984-08-21) column 1, line 66 -column 2, line 21; figures 1,2 ---- | 2 |
| A | EP 0 517 491 A (IBM) 9 December 1992 (1992-12-09) cited in the application column 12, line 58 -column 17, line 32; figures 10,15,16,21 ---- | 1-6 |
| A | US 4 701 005 A (NOGUCHI MASARU) 20 October 1987 (1987-10-20) column 5, line 58 -column 7, line 35; figure 21 ----- | 1,2 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/03085

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|---|--|
| US 4849825 A | 18-07-1989 | JP 62112246 A JP 62145545 A DE 3680865 A EP 0222238 A US 5050155 A | 23-05-1987 29-06-1987 19-09-1991 20-05-1987 17-09-1991 |
| US 5278817 A | 11-01-1994 | JP 1178154 A JP 2683004 B JP 1182931 A JP 1194154 A JP 2589339 B US 5115423 A | 14-07-1989 26-11-1997 20-07-1989 04-08-1989 12-03-1997 19-05-1992 |
| US 5933277 A | 03-08-1999 | NONE | |
| US 4467188 A | 21-08-1984 | JP 57114112 A DE 3200137 A GB 2092854 A, B | 15-07-1982 21-10-1982 18-08-1982 |
| EP 0517491 A | 09-12-1992 | US 5202875 A BR 9202061 A CA 2066152 A CN 1120717 A, B CN 1120718 A, B CN 1230747 A CN 1221179 A CN 1239280 A CN 1239281 A CN 1239282 A JP 2502884 B JP 5151591 A KR 9607253 B KR 131249 B | 13-04-1993 02-02-1993 05-12-1992 17-04-1996 17-04-1996 06-10-1999 30-06-1999 22-12-1999 22-12-1999 22-12-1999 29-05-1996 18-06-1993 29-05-1996 18-04-1998 |
| US 4701005 A | 20-10-1987 | JP 60108802 A | 14-06-1985 |